



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/SE98/01852 (22) International Filing Date: 15 October 1998 (15.10.98) (30) Priority Data: 9703920-0 24 October 1997 (24.10.97) SE (71) Applicant (for all designated States except US): TERACOM AB [SE/SE]; P.O. Box 17666, S-118 92 Stockholm (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): THOMSEN, Perry [SE/SE]; Bjureruds Gamla Skola, S-651 93 Karlstad (SE). (74) Agents: GRAUDUMS, Valdis et al.; Albihns Patentbyrå Göteborg AB, P.O. Box 142, S-401 22 Göteborg (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: METHOD FOR TRANSFERRING INFORMATION <p>The diagram illustrates a system for transferring information. On the left, a block labeled 420 (information provider) is connected to a television signal path. This path includes a switch (404) and a decoder (422). The signal path is labeled with 401, 402, and 403. A dashed box (423) indicates a replacement of the digitally coded sound signal (403) with information (400) coded in a way that cannot be mistaken by primary receivers for the digitally coded sound. On the right, a block labeled 433 (information consumer) is connected to the signal path. The signal path is also labeled with 424 and 435. The signal path is also labeled with 421, 401, 402, 403, 433, and 434.</p>		
(57) Abstract A method for transferring information from an information provider (420) to an information consumer in a highly efficient manner by means of a television signal (401, 402, 404) without adversely effecting the intended primary receivers of the television signal. The used television signal comprises a video signal (401), an analog sound signal (402), and a digitally coded sound signal (403) such as NICAM as an additional service to the video and analog sound signal. According to the invention the digitally coded sound signal is replaced with the information (400) to be transferred coded in such a way it cannot be mistaken by the primary receivers for the digitally coded sound.		

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Method for transferring information

FIELD OF THE INVENTION

5 The present invention relates generally to a method of
information transfer, for example an electronic map,
multimedia applications, advertisements or the like, with
one or more radiofrequency receivers such as mobile,
portable, and stationary radiofrequency receivers, using a
10 television signal.

BACKGROUND TO THE INVENTION

There exists a number of different methods of transferring
information from an information/content provider to an
information consumer, i.e. to the destination where the
15 information/content is intended to be used. There are
several systems where a transmission channel for a primary
service, such as analog radio broadcasting or terrestrial
television, has an additional data transmission channel.
The additional data transmission channel usually provides
20 an additional service or functionality to the primary
service. An example of such an additional service is
teletext in a television broadcasting system, an additional
service where a viewer can, for example, have sub-titles in
a preferred language to a viewed program, i.e. the primary
25 service. Another additional service in television
broadcasting systems is NICAM which transfers one or more
digitized sound channels, such as stereo or original sound
and dubbed sound. NICAM is transferred in a subcarrier to
a television channel, the primary service, it belongs to.

However, there exists a demand to be able to transfer information from an information provider to one or more information consumers which is unrelated to a primary service. One such method can be to use telephone lines, which becomes cumbersome, time consuming, and expensive if the quantity of information is large and is to be transferred to a plurality of information consumers. Therefore it can be advantageous to use, for example, existing terrestrial television broadcasting systems for such information transfers, if it is possible, since these existing systems can provide a cost effective way to transfer information to a plurality of information consumers. A system which utilizes a possibility to transfer information by means of an existing broadcasting system is RADTEX / VBI (vertical blank interval) which transfers information superimposed during a video signal's blanking interval. RADTEX / VBI-technology can transfer approximately 168 kbit/second, which is insufficient for some applications. Therefore there exists a need for expanding the transfer speed and the total transfer capacity in a cost effective manner.

SUMMARY OF THE INVENTION

An object of the invention is to define a method for providing an efficient manner of transferring addressable information via a broadcasting system to one or more addressable information consumers.

Another object of the invention is to define a method which is able to transfer information via a broadcasting system without interrupting the primary service of the broadcasting system.

The above-mentioned objects are achieved in accordance with the invention by a method for transferring information from an information provider to an information consumer in a highly efficient manner by means of a television signal without adversely effecting the intended primary receivers of the television signal. The used television signal preferably comprises a video signal, an analog sound signal, and a digitally coded sound signal such as NICAM as an additional service to the video and analog sound signal. According to the invention the digitally coded sound signal is replaced with the information to be transferred coded in such a way it cannot be mistaken by the primary receivers for the digitally coded sound.

The aforementioned objects are also achieved according to the invention by a method for transferring information from an information provider to one or more information consumers by means of a television signal of a television broadcasting system. The television signal when originated from a television signal source comprises an analog video signal, an analog preferably frequency modulated sound signal and a digitally coded sound signal. The digitally coded sound signal is coded in a sound format that television sets equipped to receive the digitally coded sound signal when properly received can decode and use for sound reproduction instead of the analog frequency modulated sound signal. The basic method according to the invention comprises the following two steps. In a first step the information to be sent is coded in an information format which is different from the sound format in such a way that the information is determined to be interpreted as a corrupt digitally coded sound signal if received in place of the digitally coded sound signal by a television set equipped to receive digitally coded sound signals. In a second step the information coded in an information format is added to the television signal in place of the digitally

coded sound signal. In a preferable embodiment the sound format of the digitally coded sound signal is NICAM.

To differentiate the information format from the sound format the information format can for example have a frame length which is different to the frame length of the sound format, the frame length of the information format can for example be longer than the frame length of the sound format. Another way that can be used is to let the information format have a different method of synchronization compared to the method of synchronization used with the sound format. As an example if the digitally coded sound format is NICAM which has at least one synchronization word at the beginning of each frame then the information format can advantageously have at least one synchronization word spread throughout each information format frame.

The method can also in some embodiments advantageously further comprise the following three steps. In a first additional step the television signal is received by an information consumer. In a second additional step it is determined if a digitally coded sound signal or if information coded in an information format is transferred. And finally in a third additional step the received information is processed if it is determined that information coded in an information format was transferred. The third additional step of processing the received information can in some embodiments advantageously comprise verifying if the information is addressed to the information consumer.

The aforementioned objects are also achieved by a method for receiving information transferred from an information provider by means of a television signal of a television broadcasting system. The television signal from a

television signal source comprises an analog video signal, an analog frequency modulated sound signal and a digitally coded sound signal. The digitally coded sound signal is coded in a sound format that television sets equipped to receive the digitally coded sound signal when properly received can decode and use for sound reproduction instead of the analog frequency modulated sound signal. According to the invention the method comprises the following three steps. In a first step the television signal is received and demodulated to a base band. In a second step it is determined if a digitally coded sound signal or if information coded in an information format is transferred in place of the digitally coded sound signal. The information format is different from the sound format in such a way that the information is determined to be interpreted as a corrupt digitally coded sound signal if received in place of the digitally coded sound signal by a television set equipped to receive digitally coded sound signals. And finally in a third step the received information is processed if it is determined that information coded in an information format was transferred.

By providing a method for transferring information from an information provider to an information consumer by borrowing part of the capacity of a television signal, a plurality of advantages over prior art systems are obtained. The ordinary receivers / viewers of the television signal will hardly or most probably not notice at all that the sound is analog sound and not digitally coded sound during an information transfer. If stereo is available in the digitally coded sound this will be lost during information transfers. By using television signals to transfer information, access to a very large broadcasting network is provided allowing for transfer / broadcasting of the same information to a very large number of information consumers in a very cost effective and

rapid manner. Modifications necessary on existing equipment to be able to add the information to the television signal are simple which results in modest required investments in hardware to be able to use the method according to the invention.

DESCRIPTION OF THE FIGURES

The invention will now be described in more detail for explanatory, and in no sense limiting, purposes, with reference to the following figures, in which

- 10 Fig. 1 shows a compound baseband television signal,
- Fig. 2 shows a block diagram of parts of a TV receiver,
- Fig. 3 shows a flow chart of how digitally coded sound and analog sound is switched between in a TV receiver,
- 15 Fig. 4 shows a block diagram of the data distribution part according to the invention,
- Fig. 5 shows a flow chart of one method of switching between digitally coded sound and data transmission,
- 20 Fig. 6 shows a block diagram of a data receiver according to the invention,
- Fig. 7 shows a flow chart of the basic functionality of a data receiver according to the invention,

Fig. 8 shows a block diagram of parts of a combined TV receiver / data receiver according to the invention,

5 Fig. 9 shows a flow chart of the basic functionality for data reception in a combined TV receiver / data receiver according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

10 In order to clarify the system according to the invention, some examples of its use will now be described in connection with Figures 1 to 9.

Figure 1 shows a compound baseband television signal with the X-axis 108 representing frequency and the Y-axis 109 representing amplitude. The video signal 101 has a bandwidth of approximately 5 MHz. The analog sound signal 102, which is normally frequency modulated and sometimes called FM-sound, is located higher in frequency than the video signal 101 to which it belongs. The analog sound signal 102 has its own subcarrier. To be able to provide higher quality sound and the possibility to provide a viewer with stereo sound or two different soundtracks for a corresponding video signal 101 a digitally coded sound signal 103 has been provided as an additional service. The digitally coded sound signal such as NICAM, is provided with a subcarrier which is higher in frequency than the subcarrier for the analog sound signal 102. The video signal 101, the analog sound signal 102, and the digitally coded sound signal 103 are comprised in what will be referred to as a television signal. There are television signals without the additional service in the form of a digitally coded sound signal but the present invention cannot be employed on such television signals.

Figure 2 shows a block diagram of parts of a television receiver 231 which is able to decode and use the additional service a television signal can provide in the form of providing a digitally coded sound signal 203 such as NICAM.

5 Modulated television signals are either received via a television antenna 233, a satellite antenna 234 or via a cable network 235. A selected modulated television signal is tuned to and demodulated in a tuner 236 which preferably splits the television signal into its components which

10 comprise a video signal 201, an analog sound signal 202, and a digitally coded sound signal 203. The tuner 236 also preferably creates a control signal 206 which indicates if a digitally coded sound signal 203 is correctly received or not, i.e. if the digitally coded sound signal 203 is

15 corrupted beyond any possibility of recovery the signal will indicate the same as if the signal was absent. The control signal 206 controls a switch 237 which will feed a speaker 238 with an audio signal 205 based either on the analog sound signal 202 or the digitally coded sound signal

20 203. If a correctly demodulated digitally coded audio signal 203 is available the control signal 206 will control the switch 237 to provide the speaker 238 with an audio signal 205 based on the digitally coded sound signal 203.

25 If for some reason the digitally coded sound signal 203 is corrupted or not available then the control signal will control the switch 237 to provide the speaker 238 with an audio signal 205 based on the analog sound signal 202. This means that a to the viewed picture appropriate sound will always be provided to a viewer regardless if there

30 exists a digitally coded sound signal 203 or not.

Figure 3 shows a flow chart of how digitally coded sound such as NICAM and analog sound such as FM sound is switched between in a television receiver. In a determination step 353 it is determined if a digitally coded sound signal is

35 available with, within predetermined acceptable limits,

correct synchronization symbols and correct frame lengths. If a digitally coded sound signal is determined to be available according to the determination step 353 then in a digitally coded sound step 355 the sound provided is based on the digitally coded sound signal. On the other hand if it is determined that there is no digitally coded sound signal available then in an analog sound step 354 the sound provided is based on the analog sound signal. The determination in the determination step 353 is preferably performed continuously. Normally the sound can also manually be forced to be based on the analog sound signal irrespective of the determination made in the determination step 353.

Figure 4 shows a block diagram of the data distribution part according to the invention. An information/content provider 420 provides information to be transferred to one or more information consumers in the form of a data / information signal 400. The data / information signal 400 has been provided with a data / information format which is significantly different from a digitally coded sound format of a digitally coded sound signal 403 provided by a television signal source 421 such as a television studio. The data / information format has to be at least so much different from the digitally coded sound format so that a television receiver, for example a television receiver according to figures 2 and 3, with an extremely high probability will reject a received signal with the data / information format and not determine such a signal to be a correctly received digitally coded sound signal 403. In a preferred embodiment the digitally coded sound format is NICAM with a frame structure having a frame length of 728 bits and an 8 bit synchronization word at the start of each frame. The NICAM transfer rate is approximately 728 kbit/sec. The data / information format can in such a case, in one embodiment, have a frame structure with a

frame length in the region of 4400 bits and for example have a synchronization word evenly distributed bit by bit throughout the whole frame.

5 The television signal source 421 provides at least a television signal having a video signal 401, an analog sound signal, and a digitally coded sound signal 403. According to the invention the digitally coded sound signal 403 is interrupted by a selector 422 which is controlled by a control signal 407. The selector 422 will either let the
10 digitally coded sound signal 403 or the data / information signal 400 to pass through and be distributed in dependence of the control signal 407. The control signal 407 can be generated by the information / content provider 420 when there is information / data 400 to be transferred to an
15 information consumer or the control signal 407 can be generated by some other means.

After the selector 422 the television signal comprises the video signal 401, the analog sound signal 402, and a data / sound signal 404 which will pass a possible distribution
20 network 423 for distribution to one or more modulator / transmitter units 424 for transmission / broadcasting of the television signal to one or more viewers. The transmission can for example be terrestrial via a television antenna 433 or via a cable network 435. The transmission
25 can also be by satellite via a satellite uplink 434.

Figure 5 shows a flow chart of one method of switching between digitally coded sound and an information / data transmission. In a determination step 556 it is determined if information / data or digitally coded sound is to be
30 broadcasted with the television signal. If there is no information / data to be transferred to one or more information consumers or if the information / data to be transferred has a very low priority then digitally coded

sound, such as NICAM, is added to the television signal in a broadcast digital sound step 557. On the other hand if there is information / data of a high priority to be transferred or if there is no digitally coded sound and there is information / data of low priority to be transferred then the information / data is added to the television signal in an information / data transfer step 558.

Figure 6 shows a block diagram of one embodiment of a data / information receiver 630 according to the invention. The data / information receiver 630 can be implemented as a stand alone or for example be implemented as an adapter card which interfaces to a computer such as a personal computer. The data / information receiver 630 preferably comprises a tuner 636 which will demodulate a desired television signal received either by a television antenna 633, a satellite antenna 634 or via a cable network 635. It is to be understood that the receiver can comprise one or more of these. A data / digital sound signal 604 is extracted by the tuner 636 and fed to a data processing unit 639. The data processing unit 639 will at least determine if the data / digital sound signal 604 is an information / data signal in the appropriate information format or not. As mentioned above a check is made of the frame length and one or more synchronization words to verify the format. If the data / digital sound signal 604 has an appropriate format then the information is extracted and either further processed or transmitted to as an information / data signal 600 to an end user or other processing means. The further processing can comprise checking if the information comprises an addressing and if so if it corresponds to the address given to the receiver.

Figure 7 shows a flow chart of the basic functionality of a data receiver according to the invention, for example a

data receiver according to figure 6. In a determination step 750 it is determined if the received signal has the correct frame length and synchronization word or words. If the received signal is not determined to be a correct information / data signal then the determination step 750 is simply repeated. On the other hand if the received signal is determined to be a correct information / data signal then the information / data is processed in a processing step 751 and possibly either distributed or used in a further processing step 752. Thereafter the procedure advantageously proceeds with the determination step 750 once again.

Figure 8 shows a block diagram of parts of a combined television receiver / data receiver 832 according to the invention. A desired modulated television signal is demodulated in a tuner 836 after having been received either by a television antenna 833, a satellite antenna 834, or via a cable network depending on how the television signal is broadcasted and what means the television receiver / data receiver 832 have for reception of television signals. The tuner 836 extracts an analog sound signal, a data / digital sound signal 804, and further signals which are not shown that are necessary for the proper operation and functionality of the television receiver. Both the analog sound signal 802 and the data / digital sound signal 804 enter a selector 837 for providing a speaker 838 with an analog sound signal 805 derived either from the analog sound signal 802 or the digitally coded sound signal part of the data / digital sound signal 804 depending on if there is any digitally coded sound signal available or if the selector is manually or by other means overridden. The tuner 836 also preferably creates a control signal 806 which controls the selector 837 in dependence of the availability of a digitally coded sound signal. If there is no digitally coded sound signal

available within the data / digital sound signal 804 then the selector the selector will direct the data / digital sound signal 804 to a data processing unit 839. The data processing unit 839 will at least check the data / digital sound signal 804 to determine if there is a valid information / data signal available and if so then either do further processing within the data processing unit 839 or transfer the information / data signal 800 to other units either internally within the television receiver / data receiver 832 or externally. The information / data signal 804 can, for example, be MPEG4 coded television signals which can be decoded to four different live television signals. Another example is that the information / data signal carries a plurality of sound channels, for example coded in the same way as in the DAB (digital audio broadcasting) standard.

Figure 9 shows a flow chart of the basic functionality for data reception in a combined TV receiver / data receiver according to the invention. In a first determination step 953 it is determined if a digitally coded sound signal is available with, within predetermined acceptable limits, correct synchronization symbols and correct frame lengths. If a digitally coded sound signal is determined to be available according to the first determination step 953 then in a digitally coded sound step 955 the sound provided is based on the digitally coded sound signal. On the other hand if it is determined that there is no digitally coded sound signal available then in an analog sound step 954 the sound provided is based on the analog sound signal and the procedure continues to a second determination step 950. In the second determination step 950 it is determined if the received signal has the correct frame length and synchronization word or words for an information / data signal. If the received signal is not determined to be a correct information / data signal then the procedure

returns to the first determination step 953. On the other hand if the received signal is determined to be a correct information / data signal then the information / data is processed in a processing step 951 and possibly either distributed or used in a further processing step 952.

The present invention can be put into apparatus-form either as pure hardware, as pure software or as a combination of hardware and software. If the method according to the invention is realised in the form of software, it can be completely independent or it can be one part of a larger program. The software can suitably be located in a general purpose computer or in a dedicated computer.

As a summary, the invention can basically be described as a method which provide an efficient manner of transferring information to an information consumer within a network using a television signal. An additional service of the television signal, digitally coded sound, is exchanged with the information which is to be transferred. The information is coded in a format which with a high probability will distinguish the information from the digitally coded sound and not be mistaken for it. Television receivers able to make use of the additional service will therefore reject the information as simply a corrupted and therefore unacceptable digitally coded sound signal.

The invention is not limited to the embodiments described above but may be varied within the scope of the appended patent claims.

CLAIMS

1. A method for transferring information from an information provider to one or more information consumers by means of a television signal of a television broadcasting system, the television signal from a television signal source comprising an analog video signal, an analog frequency modulated sound signal and a digitally coded sound signal, the digitally coded sound signal being coded in a sound format that television sets equipped to receive the digitally coded sound signal when properly received can decode and use for sound reproduction instead of the analog frequency modulated sound signal characterized in that the method comprises the following steps:
- coding the information to be sent in an information format which is different from the sound format in such a way that the information is determined to be interpreted as a corrupt digitally coded sound signal if received in place of the digitally coded sound signal by a television set equipped to receive digitally coded sound signals;
 - adding the information coded in an information format to the television signal in place of the digitally coded sound signal.
2. The method according to claim 1, characterized in that the sound format of the digitally coded sound signal is NICAM.

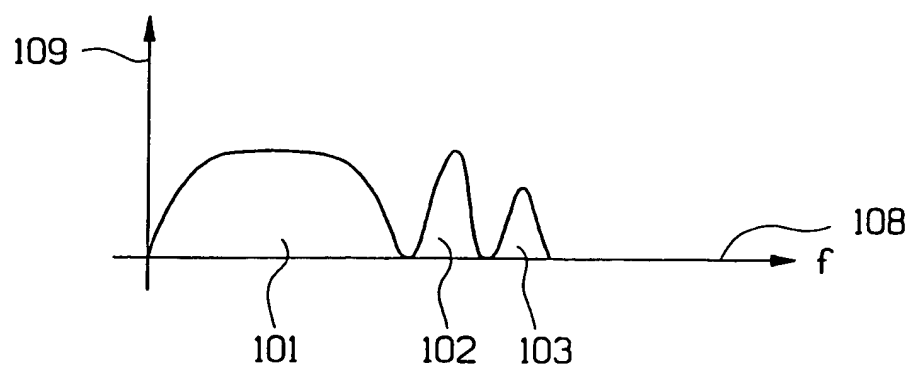
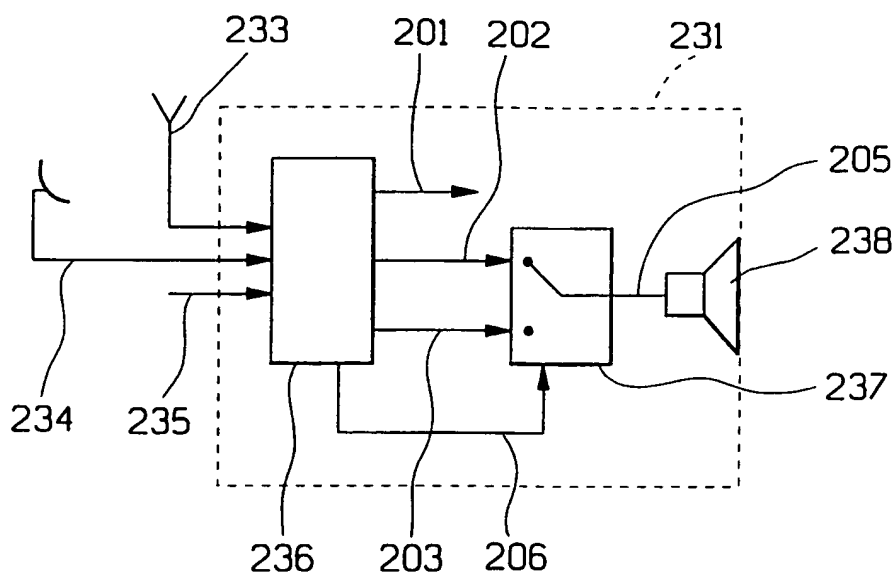
3. The method according to claim 1 or 2, characterized in that the information format has a frame length which is different to the frame length of the sound format.
- 5 4. The method according to claim 3, characterized in that the frame length of the information format is longer than the frame length of the sound format.
- 10 5. The method according to any one of claims 1 to 4, characterized in that the information format has a different method of synchronization compared to the method of synchronization used with the sound format.
6. The method according to claim 5, characterized in that the information format uses at least one synchronization word spread throughout each information format frame.
- 15 7. The method according to any one of claims 1 to 6, characterized in that the method further comprises the following steps:
- receiving the television signal by an information consumer;
 - 20 - determining if a digitally coded sound signal or if information coded in an information format is transferred;
 - processing the received information if it is determined that information coded in an information
 - 25 format was transferred.
8. The method according to claim 7, characterized in that the step of processing the received information comprises verifying if the information is addressed to the information consumer.
- 30 9. A method for receiving information transferred from an information provider by means of a television signal of

- a television broadcasting system, the television signal from a television signal source comprising an analog video signal, an analog frequency modulated sound signal and a digitally coded sound signal, the digitally coded sound signal being coded in a sound format that television sets equipped to receive the digitally coded sound signal when properly received can decode and use for sound reproduction instead of the analog frequency modulated sound signal characterized in that the method comprises the following steps:
- receiving and demodulating the television signal to a base band;
 - determining if a digitally coded sound signal or if information coded in an information format is transferred in place of the digitally coded sound signal, the information format being different from the sound format in such a way that the information is determined to be interpreted as a corrupt digitally coded sound signal if received in place of the digitally coded sound signal by a television set equipped to receive digitally coded sound signals;
 - processing the received information if it is determined that information coded in an information format was transferred.
10. The method according to claim 9, characterized in that the sound format of the digitally coded sound signal is NICAM.
11. The method according to claim 9 or 10, characterized in that the information format has a frame length which is different to the frame length of the sound format.
12. The method according to claim 11, characterized in that the frame length of the information format is longer than the frame length of the sound format.

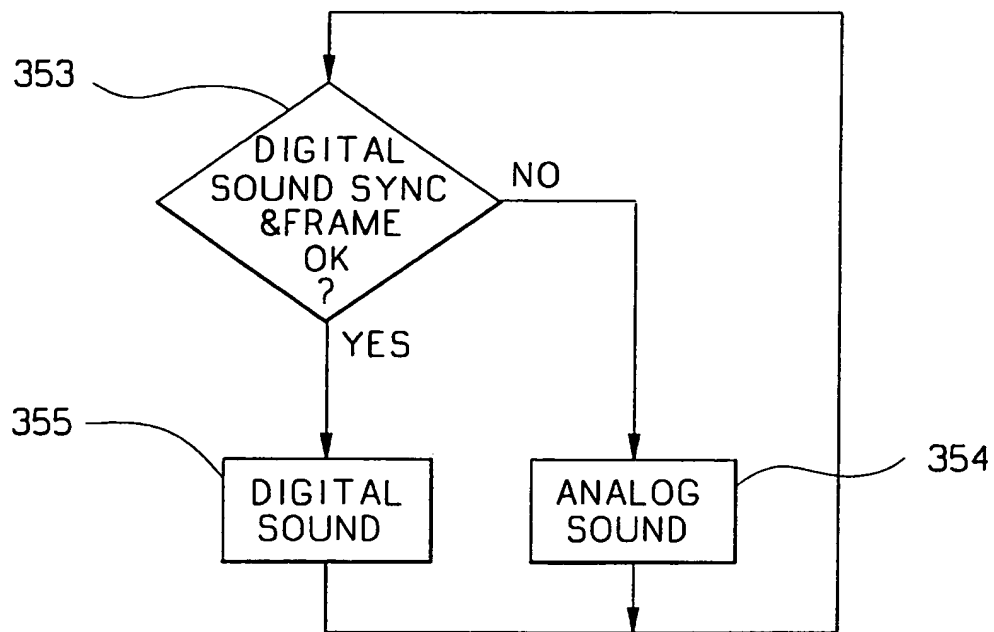
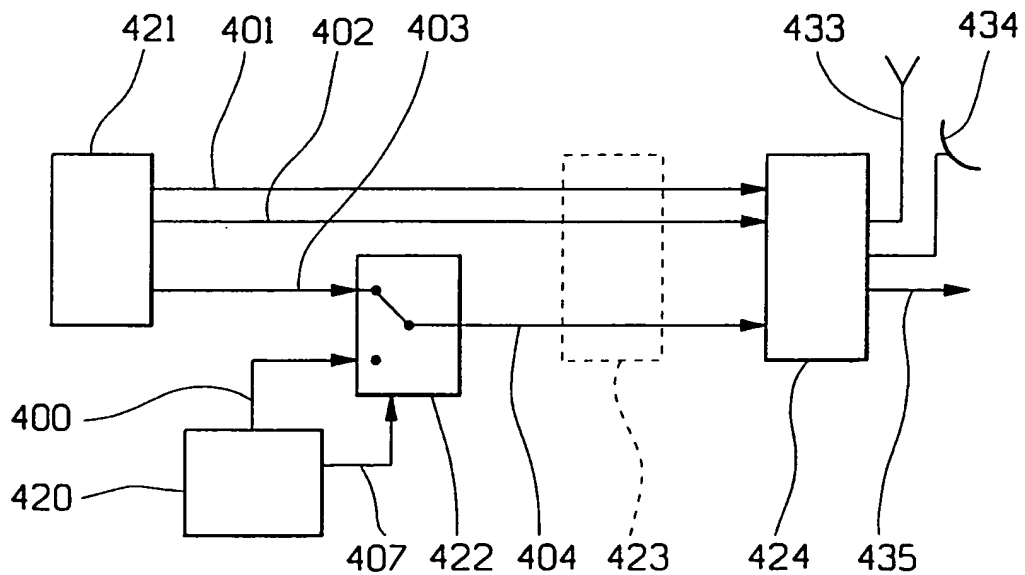
13. The method according to any one of claims 9 to 12,
characterized in that the information format has a
different method of synchronization compared to the method
5 of synchronization used with the sound format.

14. The method according to claim 13, characterized in
that the information format uses at least one
synchronization word spread throughout each information
format frame.

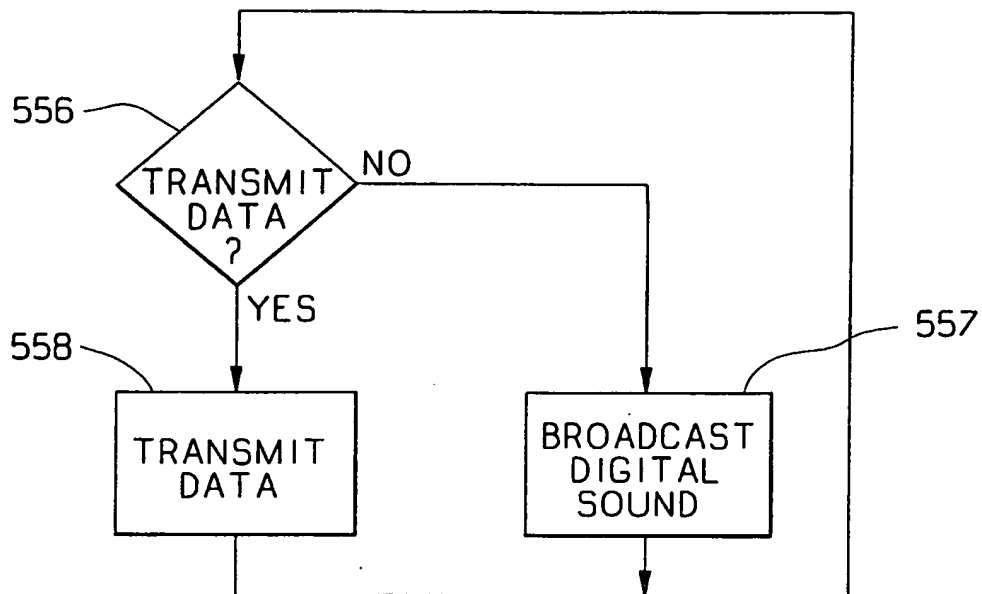
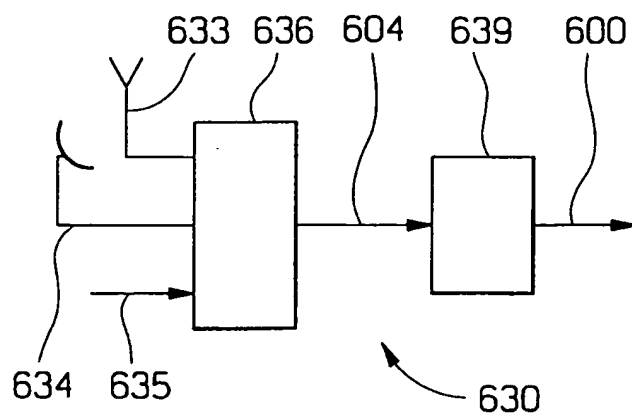
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FIG. 1FIG. 2

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FIG. 3FIG. 4

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FIG. 5FIG. 6

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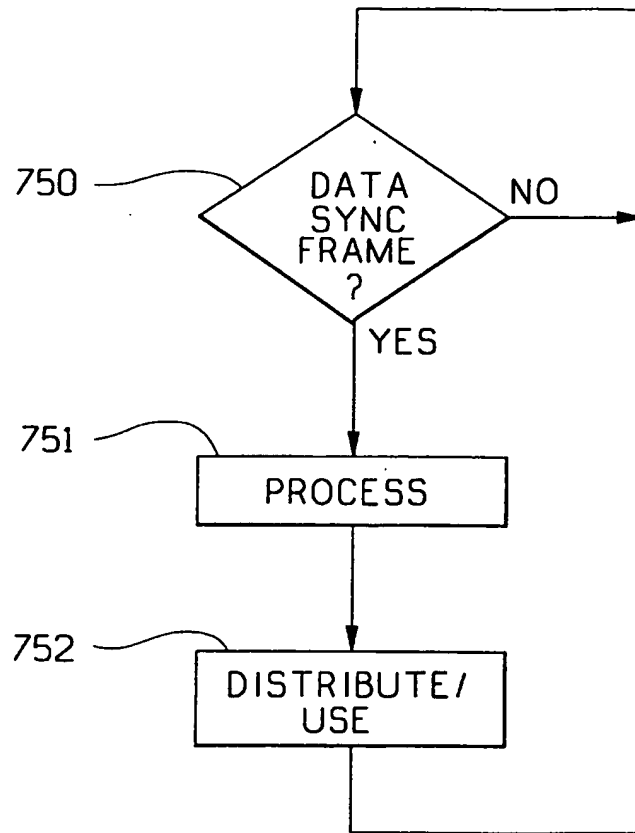


FIG. 7

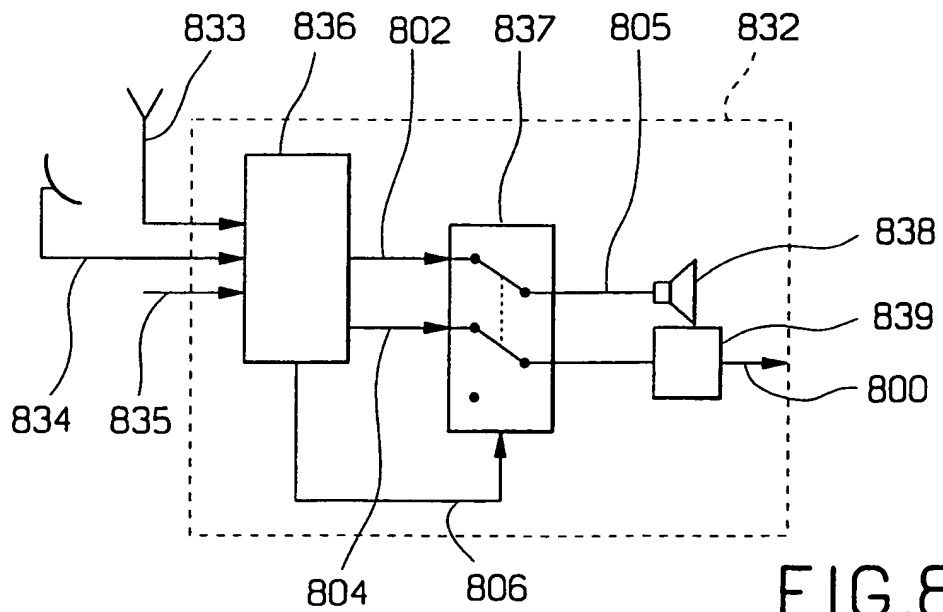
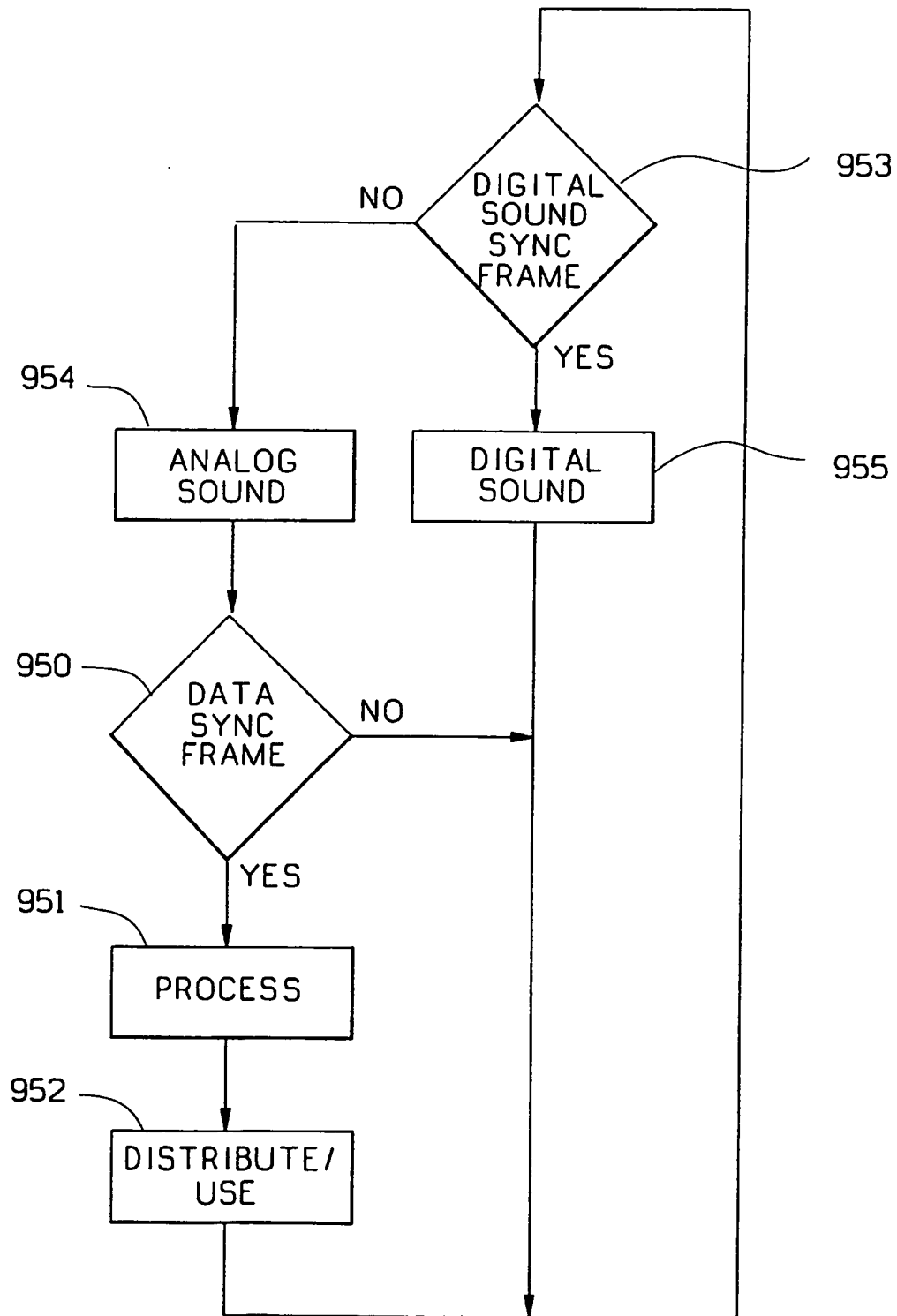


FIG. 8

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FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01852

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04N 5/60, H04N 7/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0669763 A2 (SONY CORPORATION), 30 August 1995 (30.08.95), abstract --	1-14
A	EP 0374433 A1 (GRUNDIG E.M.V.), 27 June 1990 (27.06.90), abstract --	1-14
A	WO 9013206 A1 (COMPLAN NETWORK A/S), 1 November 1990 (01.11.90), claim 1, abstract -- -----	1-14

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